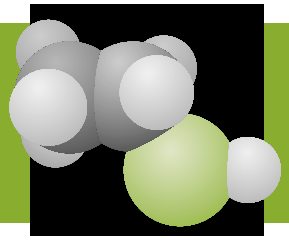
Technology Success Story

CHEMICALS



Multi-Phase Fluid Dynamics Research Consortium

Computational Technology to Improve Industrial Productivity

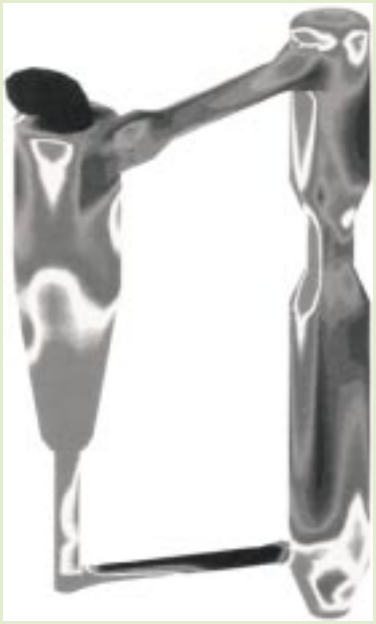
Benefits

- Increased operating capacity of gas-solid flow by as much as 90 percent
- Increased capacity of overall gas-solid processes by 10 to 20 percent
- Increased yield of products from multi-phase flow processes

Many plants handle fine-grained solid materials during processing by sending them through pipes as suspended particles in a gas or gas-liquid flow. However, gas-solid flows are complex and difficult to predict, often leading to costly inefficiencies. Although gas-solid flows can work well, some facilities experience 30 to 40 percent downtime due to complications such as clogged pipes. Such flow problems cost companies an estimated $1 billion per year.

Dow Chemical, DuPont, Exxon, and others are now looking to Computational Fluid Dynamics (CFD) to improve the way they handle solid materials in manufacturing plants. CFD has applications in the petroleum and petrochemical industries as well as in biobased process chemistry and engineering. Companies can use CFD models to simulate the movement of particles as they are transported through a gas flow, to predict problems, and to adjust or redesign equipment for more efficient flow. In an effort to develop more effective CFD modeling tools for materials handling, top corporations, national labs, and universities have joined forces through the Multi-Phase Fluid Dynamics Research Consortium.

CFD Model for Materials Transport



Computational Fluid Dynamics can dramatically improve the efficiency of material transport in plants.

"This is a project all chemical producers need to reduce costs, energy consumption, and waste."

Tyler Thompson, Research Partnership Leader, Dow Chemical Company

Solution

With its current membership of ten corporations, five national labs, and seven universities, the Multi-Phase Fluid Dynamics (MFD) Research Consortium is advancing modeling technology for materials transport. The consortium undertakes a balanced program of fundamental research and technology development. With more accurate, reliable, and cost-effective computational modeling tools for industry applications, partners plan to develop commercial software packages.

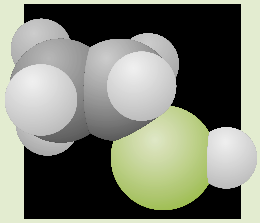
New and improved Computational Fluid Dynamics (CFD) techniques will allow companies to simulate the movement of particles as they are transported through a gas flow. Simulations of multi-phase flows using CFD can provide industry with accurate data on movement and a better understanding of the physics involved. Computers generate multi-phase calculations, and sensors measure properties of the gas-solid or gas-liquid-solid flows. Visualization of fluid flows will support improved equipment design and increased productivity.

Results

With the U.S. Department of Energy's Office of Industrial Technologies providing $1 million per year in funding, the Multi-Phase Fluid Dynamics Research Consortium is already yielding benefits to members. Through cost-sharing programs, industrial partners are providing universities and national labs with equipment and practical knowledge for experimental research. The consortium has also created a valuable networking opportunity for participating companies and graduate students.

For DuPont and Dow Chemical, CFD techniques could improve production efficiency for half of all their products. They expect to apply the technology to a wide variety of chemicals and plastics production processes. Dow Corning also has specific plans to use CFD models for handling silicone.

Chevron and Exxon plan to use CFD to improve the efficiency of oil refining. CFD techniques can improve efficiency of current systems used to retrieve, store, and package $60-billion worth of petroleum, petrochemical, and biobased products manufactured each year. Potentially, CFD could raise efficiency by 5 percent. However, an improvement of even 1 percent would save 100 million barrels of oil annually.



Project Partners:

AEA Technology
Chevron
Clarkson University
Dow Chemical Company
Dow Corning
DuPont
Exxon
Fluent
Illinois Institute of Technology
Los Alamos National Laboratory
Millennium Inorganic Chemicals
National Energy Technology Laboratory
Oak Ridge National Laboratory
Pacific Northwest National Laboratory
Particulate Solids Research, Inc.
Purdue University
Princeton University
Sandia National Laboratories
Siemens Westinghouse Power Corporation
University of Colorado
University of Michigan
Washington University-St. Louis

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